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The acquisition of Catalan passives with perception verbs

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1. INTRODUCTION

Many scholars from different linguistic backgrounds have studied the passive voice and have found that passivisation poses a problem in the early acquisition of the first language. There are many cross-linguistic studies about the passive voice: on English (Maratsos et al. 1985; Borer and Wexler, 1987), Spanish (Pierce, 1992; Oliva and Wexler, to appear), Catalan (Parramon, 2009; Cunill, 2012; Gavarró and Parramon, 2017), Greek (Terzi and Wexler, 2002), among others.

There are two major findings about the delay in passives (Deen, 2011: 162) in most of the languages studied. Firstly, acquisition is not homogeneous across verb classes (Maratsos et al., 1985; in Borer and Wexler, 1987). Secondly, full passives (or ‘long passives’, as they will be called throughout this study), which are the passive constructions with the *by-phrase*, are seemingly acquired later than short passives (Borer and Wexler, 1987).

This present study focuses on the acquisition of Catalan verbal passives with perception verbs, specifically: *veure* (‘see’) and *sentir* (‘hear’), since there has not been any previous study on Catalan passives focusing in perception verbs.

The goal of the study is to discover the age at which Catalan passives, both short and long, with perception verbs are understood, since, as we will see, psychological passives are the key to know when children truly understand verbal passives.

1.1 Theoretical framework

The first important studies done about passives in English were by Maratsos et al. (1985) and Borer and Wexler (1987). From Borer and Wexler (1987) onwards, it has been accepted that there is a clear delay in the acquisition of passives in many languages and one of the explanations for this has been the “maturational effect”, by which the linguistic properties that are employed in the use of passives are yet to mature as children develop biologically (Borer and Wexler, 1987: 124-125). Therefore, as soon as their grammar matures, passives should not represent a problem for typically developing children. The issue comes when we ask what mechanisms need to mature in order to fully comprehend passives. Borer and Wexler (1987) proposed the A(argument)-Chain Delay Hypothesis (ACDH) which basically hypothesises that children are unable to move the post-verbal noun phrase (NP), which is the internal argument (the object), to the external argument position of the passive sentence. The external theta role is absorbed by the passive morphology and optionally transmitted to

the *by*-phrase. This can be represented as in (1). In essence, children who do not have a mature grammar are not able to “assign a theta-role to the moved NP, and would be driven to rule out the derivation” (Borer and Wexler, 1987: 149).

- (1) a. [The girl]_{Subject} kissed [the boy]
 b. The boy was kissed ~~the boy~~
 ←
 c. The boy was kissed ~~the boy~~ [by the girl]_{PP}
 ←

However, the ACDH seems no longer tenable, because as Hirsch and Wexler (2006a: 2) said, in an active sentence (1a) “the subject is base generated within the verb phrase, from which it raises to a position outside of the verb phrase [...] It is known, however, that children have no trouble raising the subject”. If the construction of A-chains was really a problem for children, they would not be able to raise the subject.

Still, one side of the analysis in Borer and Wexler (1987) remains unchanged. There are languages like English that allow the interpretation of a verbal passive as an adjectival passive. This is what Oliva and Wexler (to appear) coined “AIS” (Adjectival Interpretation Strategy). For example, in (2), the past participle *closed* can be ambiguous because it can be given a verbal reading –eventive– (2a) or an adjectival reading –stative– (2b).

- (2) *The backpack is closed*
 a. Someone closed the backpack
 b. The backpack is in the state of being closed

This would explain what Maratsos et al. (1985) had already demonstrated: English children interpret and comprehend passives with actional verbs (2) better than passives with psychological verbs (3). This is because “actional verbs give rise to well-formed adjectives in the adult grammar” (Borer and Wexler, 1987: 138) and non-actional verbs do not.

- | | | |
|-----|-------------------------------------------------|-----------------------|
| (3) | <i>The mother is painted (by the daughter).</i> | actional passive |
| (4) | <i>The mother is loved (by the father.)</i> | psychological passive |
| (5) | <i>The truth was known (*by everyone).</i> | adjectival passive |

Thus, non-actional verbs do not allow an adjectival interpretation, which explains the delay in the acquisition of psychological passives compared to that of the actional ones. There is one more fact to consider, which is the presence or absence of *by-phrases* in the passive constructions. Verbal passives allow a *by-phrase* to appear (Borer and Wexler, 1987: 136), whereas adjectival passives (5) do not, hence children only comprehend adjectival passives and they do not understand verbal passives. However, English makes this hard to test because English adjectival and verbal passives are syntactically homophonous, therefore there is ambiguity in the reading of the verb, as illustrated above.

Indirect evidence for the proposal of the adjectival interpretation of verbal passive was found in other languages such as Greek, in which verbal passives (6a) and adjectival passives (6b) are not syntactically homophonous (Terzi and Wexler, 2002).

- (6) a. *To vivlio diavastike apo tus fitites.*
the book read-Nact-3s by the students
'The book was read by the students.'
- b. *To vivlio ine diavasmeno (apo olus tus filites).*
the book is-3s read-nom-sg-neut by all the students
'The book was read (by all students).'

(Examples taken from Gavarró and Parramon, 2017: 13)

Thus, Greek children's comprehension of passives, even the passives with actional verbs, would be very poor compared to the comprehension of passives in other languages like English, in which the adjectival strategy can be used to ease comprehension of verbal passives due to the s-homophony of both types of passive.

This can be seen in the results from Terzi and Wexler (2002, cited in Gavarró and Parramon, 2017), which are shown in in Table 1. According to these results, there was above-chance performance by all age groups in adjectival passives but, with the verbal passives, the performance was much worse, independently of verb type. This proves that, when no adjectival strategy is used, children are not able to comprehend verbal passives.

Table 1 Percentage of correct comprehension of passives in Greek (from Gavarró & Parramon, 2017)

Age group	Non-act verbal pass	Act verbal pass	Act Adj pass
3;8-3;10	20%	3%	83%
4;2-4;10	13%	33%	77%
5;3-5;10	20%	44%	89%

In the next section, we contrast this with Catalan, which is a language that is different from English because verbal and adjectival passives are not strictly syntactic homophones, but is not like Greek either because the overall structure of both passives is the same except for the different auxiliary used in each construction.

1.2 Passives in Catalan

Catalan has two main types of passive structures (Bartra, 2002), exemplified in (7).

- (7) a. *La nena és pentinada (per la mare).*
the girl be-Pres combed (by the mother)
‘The girl is combed by the mother.’
- b. *La nena està pentinada.*
the girl be-Pres combed
‘The girl is combed.’
- c. *Aquest any s’ha treballat molt.*
this year se-clitic has worked much
‘This year people have worked a lot.’

The first type (7a) is called the *periphrastic* passive or what in the literature is known as verbal passive; this construction is formed with the auxiliary *ser* (‘to be’) plus the past participle of the verb, and its derivation follows the pattern in (1). The second type (7b) is named *stative* passive, also known as adjectival passive. This passive structure uses the auxiliary *estar* (also translated in English as ‘to be’) and it is accompanied by the past participle of the verb as well. As Bartra (2002: 2149-2151) mentions, there is one more type of passive, exemplified in (7c) which is a pronominal construction with an unspecified subject and the clitic *es*, but this construction is not considered in this study. Focusing on the periphrastic passive, it may have a prepositional phrase (PP), introduced by the preposition *per* (‘by’ in English), which is optional. This is considered in example (7a). When the PP is present, the structure is a long passive. In the opposite

case, when it is omitted, the structure is a short passive. It must be mentioned that the preposition *per* is not only used in passives to introduce the external theta-role (as exemplified in (8) and (9), examples taken from Cunill 2012: 11). *Per* can also introduce other thematic roles when it introduces a nominal.

- (8) *Una nena isrealiana va ser ferida* [per [un atac de palestins]_{NP}]_{PP (Means)}
 a girl Israeli be-Past hurt [by an attack of Palestine people]
 ‘An Israeli girl was hurt *by a Palestinian attack*.’
- (9) *El trasllat va ser retransmès en directe* [per [la televisió del Regne Unit]_{NP}]_{PP (Cause)}
 the evacuation be-Past broadcast live by the television of the UK
 ‘The evacuation was broadcast live by the BBC.’

Regarding the stative or adjectival passive, it cannot have a prepositional phrase that expresses an AGENT or an EXPERIENCER (Bartra, 2002: 2146), but it can express other theta-roles, as shown in (10), in which case the PP has a value of CAUSE.

- (10) *L'Eva està emocionada* [per les paraules del president.]_{PP (Cause)}
 Eva be-Present excited [by the words from the president]
 ‘Eva is excited by the president’s words.’

(Example taken from Bartra, 2002: 2146)

1.3 The acquisition of Catalan passives

There are a few previous studies about the acquisition of Catalan passives that deserve to be mentioned. First, Gavarró and Parramon (2017) carried out two experiments. In the first one they tested 173 Catalan-speaking children between the ages of 3 and 6 plus 40 adults that were used as controls. The experiment was designed to test the comprehension of actional passives, both short and long. The second experiment was designed to see whether children were interpreting short verbal passives as adjectival. The participants for this second experiment were 120 children from the ages of 3 to 8 plus 20 adults that were used as controls.

Table 2 Proportion of correct answers per age group from Gavarró and Parramon (2017)

	3-year-olds	4-year-olds	5-year-olds	6-year-olds	Adults
Active	0.84	0.94	0.98	1.00	0.99
Short pass	0.60	0.72	0.83	0.97	0.99
Long pass	0.23	0.38	0.29	0.92	0.98

The results of the first experiment (see Table 2) demonstrated that for all participants comprehension of active sentences and short actional passives was above chance. However, comprehension of long actional passives was not above chance until the age of 6, when the participants' performance improved considerably. It was found that Catalan children did not only miscomprehend verbal passives until the age of 6, but they also assigned them a reverse interpretation.

The results of the second experiment (see Table 3) agreed with the existing literature on the adjectival analysis of verbal passives at an early age. Until the age of 6, children still chose the adjectival interpretation for the verbal passives. It was not until the age of 7 when they chose the correct eventive interpretation for verbal passives. As Oliva and Wexler (to appear) commented in their article "This is striking direct information of the hypothesis of an adjectival strategy invoked by children when they haven't yet developed the mechanisms for deriving the verbal passive".

Table 3 Proportion of correct comprehension per age group from Gavarró and Parramon (2017)

Age group	Short verbal pass	Adj pass
3-year-olds	0.38	0.63
4-year-olds	0.35	0.70
5-year-olds	0.23	0.83
6-year-olds	0.28	0.81
7-year-olds	0.90	0.95
8-year-olds	0.92	0.99
Adults	0.96	0.98

Next study to mention is Cunill (2012). In his experiment he tested a total of 88 participants from 3 to 8 years of age. He analysed both active and passive structures, both with actional verbs and psychological verbs. The experiment consisted of a two-choice sentence-picture matching task. His results (see Table 4) showed that children performed equally well in actives with both verbs. In the passive voice, the performance was poorer. Catalan children interpreted short actional passives correctly at the age of 5;10. However, children understood long actional passives at the age of 6;9, an age that

would later be confirmed by Gavarró and Parramon's experiments (2017). When it comes to psychological passives, there was a delay in their acquisition. Cunill's experiment shows that short psychological passives are not easily comprehended until the age of 7;7. At this same age, long psychological passives were starting to be comprehended, although participants still showed some comprehension problems; older children were not tested.

Table 4 Percentage of correct answers by Age and Sentence type from Cunill (2012)

Age group	Act Active	Act Short pass	Act Long pass	Psyc Active	Psyc Short pass	Psyc Long pass
3;10	74%	49%	50%	72%	42%	48%
4;10	91%	67%	42%	95%	37%	37%
5;10	98%	75%	47%	98%	37%	40%
6;9	98%	88%	75%	99%	62%	48%
7;7	99%	99%	96%	99%	83%	74%

There is one last study that deserves to be mentioned due to its similarities with the studies on Catalan passives, and it is Oliva and Wexler's (to appear) on Spanish passives. They carried out two experiments. Both tested 60 native Spanish children in the age range of 3;0 and 6;11 years old and a control group of 15 adults. In the first experiment they tested the comprehension of verbal passives, both with actional and subject-experiencer verbs with a two-choice sentence-picture matching task. The results are presented in Table 5.

Table 5 Percentage of correct comprehension from Oliva and Wexler (to appear)

Age group	Actional verbs			Psychological verbs		
	Active	Short pass	Long pass	Active	Short pass	Long pass
3	88.3%	65.0%	24.2%	87.5%	30.0%	29.2%
4	95.8%	68.3%	42.5%	96.7%	28.3%	34.2%
5	96.7%	84.2%	48.3%	95.8%	40.8%	47.5%
6	99.2%	95.8%	62.5%	98.3%	53.3%	49.2%

First, the effect of voice (active versus passive) was clearly significant. Actives were consistently better understood than passives. Second, the effect of verb (actional versus subject-experiencer) was not significant within the active sentences but in the passives it was indeed significant: actional passives were better comprehended than psychological passives, which indicated that Spanish children aged 6 were using the adjectival

analysis to understand actional verbal passives. Surprisingly, the results showed no significant difference between long actional and long psychological passives, nor were there significant differences between short and long psychological passives.

The second experiment Oliva and Wexler carried out was an interpretation task replicating the second experiment that Gavarró and Parramon (2017) designed for Catalan. Oliva and Wexler were interested in discovering whether Spanish children would use the adjectival analysis as Catalan children did. This second experiment consisted of a two-choice picture selection task. The results are shown in Table 6 below. The adults performed above 95% in both conditions. However, children mostly gave the adjectival interpretation to both the verbal passives and the adjectival passives, as results in Table 6 show.

Table 6 Percentages of correct interpretation from Oliva and Wexler (to appear)

Age group	Verbal pass	Adj pass
3-year-olds	27.5%	68.3%
4-year-olds	37.5%	71.7%
5-year-olds	35.0%	80.8%
6-year-olds	40.8%	83.3%

2. EXPERIMENTAL DESIGN

2.1 Method and materials

The experiment was a two-choice sentence-picture matching task. For every item tested, the children were given a sentence by the experimenter and they had to point at the drawing that represented the correct graphic representation of the sentence, out of the two provided for every utterance. If the choice was incorrect, the picture selected by the subject corresponded to the theta-role reversal interpretation. This experiment was adapted from the experiment that was carried out in Portuguese by Agostinho and Gavarró (2017), although the present tense was chosen over the past tense to translate the items into Catalan, while the past tense was used in Portuguese. Also, in my experiment, only some of the items present in Agostinho and Gavarró's task were selected because their study targeted both actional and perception verbs, and here my focus is on active and passive sentences with perception verbs only.

The materials used to run this experiment were those used by Agostinho and Gavarró (2017). They are illustrated in Figure 1.



Figure 1 Sample of materials: *El nen és vist per l'avi 'The boy is seen by the grandfather'*

The experimental task included 16 items, 8 active sentences and 8 passive sentences. Within the 8 active sentences, 4 items used different actional verbs, such as *pintar* ('paint'), *rentar* ('wash'), *tapar* ('cover') and *pentinar* ('comb'), which were used as control items. The 4 active sentences left tested the two subject-experiencer verbs *sentir* ('hear') and *veure* ('see') used in this experiment in the active voice. For the passive sentences, 4 items were long passives and 4 more were short passives, with the subject-experiencer verbs *sentir* and *veure*.

2.2 Participants

This task was carried out by a total number of 55 children as part of the experimental group and 10 adults that comprised the control group. All participants were native Catalan-speakers with typical development, which means they did not have any language or cognitive impairment. The children that participated were recruited in the school Maria Anna Mogas, in Granollers, and the CEIP Guerau de Liost, in Les Franqueses del Vallès, both in the province of Barcelona.

The children were divided into different groups according to their age. In Table 7, details of the age and number of children are presented. The mean age of the adult participants was 34;6 (age range: 16;8,2–52;4,10).

Table 7 Participants

Age group	#	Age range	Mean age
4-year-olds	5	4;4,2 – 4;10,25	4;7
5-year-olds	10	5;1,29 - 5;11,28	5;6
6-year-olds	10	6;1,2 - 6;11,29	6;6
7-year-olds	10	7;1,2 - 7;10,23	7;6
8-year-olds	10	8;0,15 - 8;10,1	8;5
9 and 10-year-olds	10	9;0,4 - 10;1,11	9;6
TOTAL	55	4;4,2 – 10;1,11	

2.3 Procedure

Every subject of the experimental group was tested individually in a separate silent classroom. The only people in the room were the experimenter and the subject. A laptop was used to show the Power Point slides. Every participant took between 5 to 10 minutes to go over all items. At the beginning of the task, two slides with two sample pictures were shown to ensure that the subject had understood the task and was familiar with the characters.

The experimenter had the answer sheets for every student completed with the name and birth date of the participant, as well as with the date and school where the experiment took place. While carrying out the experiment, the subject was invited to click on the keyboard to visualize the next slide when told to do so and the experimenter solely marked the answer given by the subject, without judging the answer. Even when the subject replied incorrectly, the experimenter always praised the children and never told them when they were making a mistake.

For the control group the procedure changed slightly. Adults were mostly tested individually at a quiet area at home, but some were tested in a group all together, in which case every participant filled in the answer sheet. Answers were written directly on a sheet of paper and then the results were transferred to the answer sheets. The transition between slides was carried out by the experimenter, who also produced the utterances for every slide/item.

2.4 Coding

Once the experiment was finished, the answers were recorded in a Microsoft Excel sheet. If the answer from the subject corresponded to the adult-like interpretation, they were marked with a 1. If, instead, the answer differed from the adult interpretation, they were recorded as 0.

3. RESULTS

The statistical analysis of the data was carried out by the Servei d'Estadística Aplicada at the Universitat Autònoma de Barcelona using the software SAS v9.4, SAS Institute Inc., Cary, NC, USA. The statistical decisions have been carried out taking 0.05 as the significance level (i.e. a confidence interval of 95%).

With the goal of analysing the number of correct answers, a Generalised Linear Model was established taking into account the repeated measurements for each subject (binary distribution). The results from the adults were excluded from this analysis since their answers were always 100% correct. The following analysis was done: a general model taking Age group and Type sentence as covariates; a stratified model for number of correct answers in terms of Sentence Type, for each age group; a stratified model for number of correct answers in terms of Age group of participants, for each sentence type and finally, to assess the verb effect, a stratified model for each age group and type sentence was established, taking the verb as the covariate.

The number of expected answers from the group of children (age groups from 4 to 10) was 880 and, from the adults group, 160 answers, to give a total of 1040 answers. Of these, all 1040 answers were actually obtained.

The results for the main model, when Age group and Sentence Type are taken as covariates are the following. First, there are statistically significant differences affecting the number of correct answers when age is considered (F Value = 6.88; p-value <0.0001). Similarly, when the effect of Sentence Type (F Value = 43.47; p-value <0.0001) is analysed there are significant differences in the number of correct answers.

Starting with how age affects the performance of the participants, Figure 2 shows the estimated percentages of correct answers by age group, with no distinction between sentence types. There is a gradual improvement in the performance of the subjects as they become older, although the age groups of 4, 5 and 6 seem to have a very similar performance. Better performance is visible from age 7.

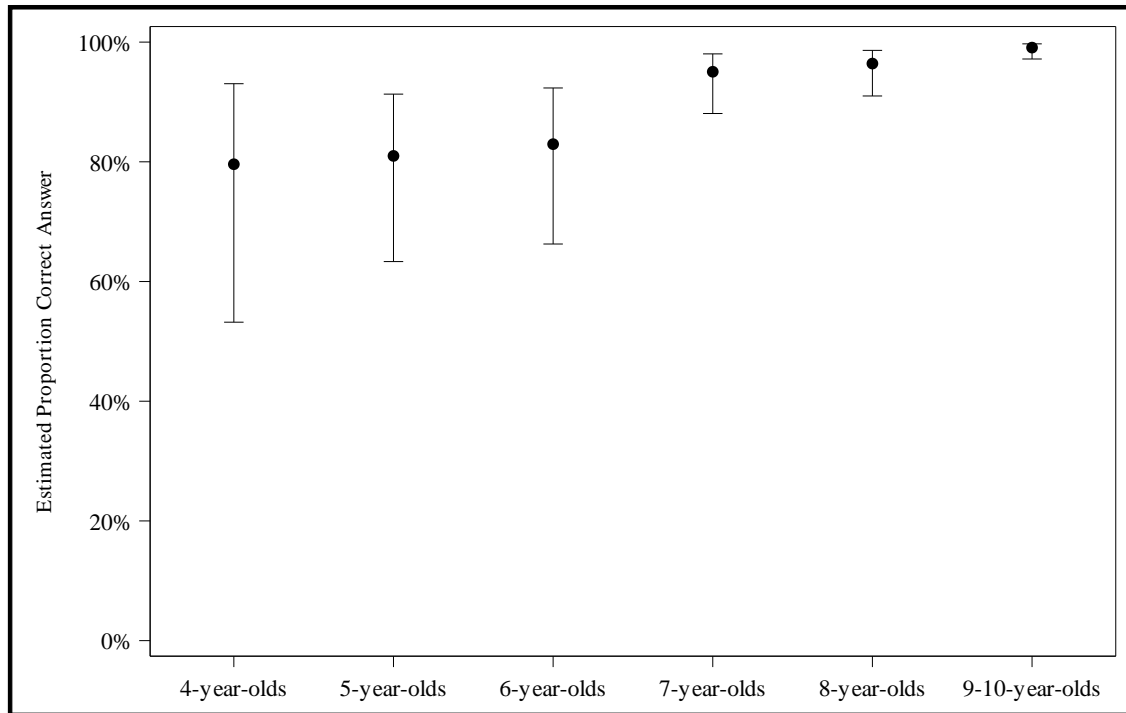


Figure 2 The effect of age

A significant main effect on the performance of participants was obtained when the type of sentence was considered. We found that, as we expected, the effect of voice (i.e. active and passive) makes significant differences. In Figure 3, the percentages of correct answers according to the effect of voice can be seen. Actives were answered correctly in 98.18% of the cases (all ages collapsed), whereas for passives correct answers represented only 55.68% of answers. However, this contrast between actives and passives is not enough because within the group of passive sentences, a further distinction must be made because the results of Short and Long passives.

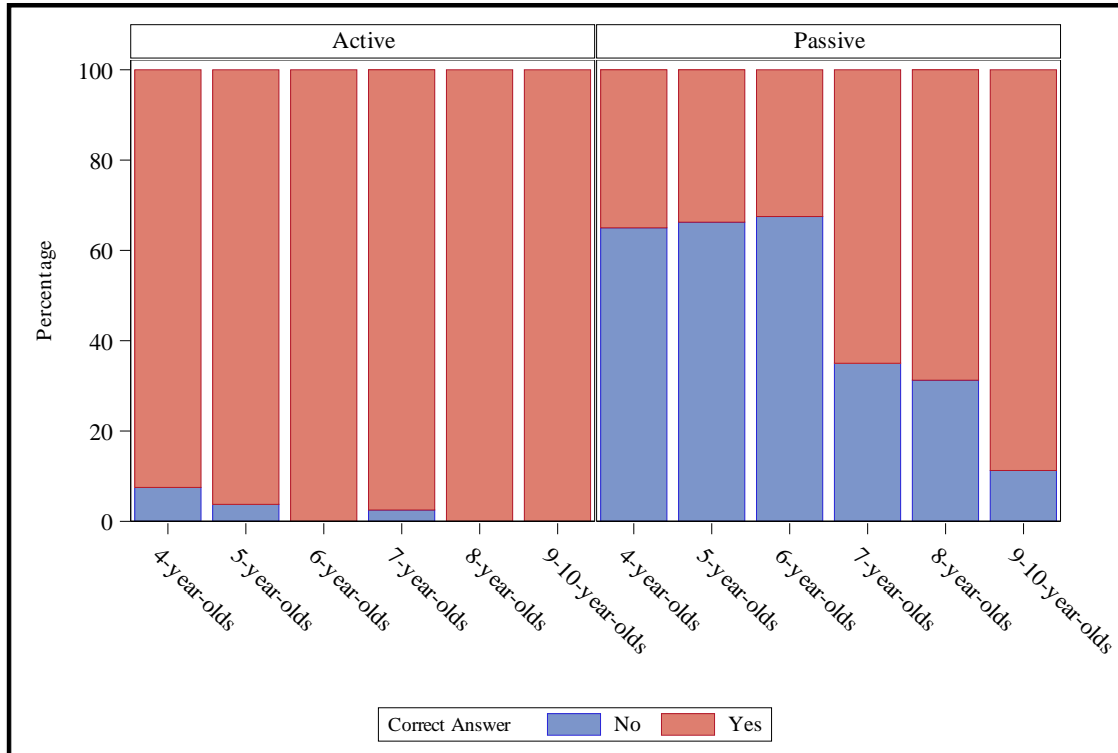


Figure 3 The effect of voice

Regarding the effect of Sentence Type, the estimated percentage of correct answers of all participants by sentence type, without making a difference between age groups, can be seen in Table 8. There are statistically significant differences between active sentences with perception verbs and short passives with perception verbs (OR=100.37; CI_{95%}=14.7, 685.45). Also, between active actional sentences and short passives, there is a significant difference (OR= 32.06, CI_{95%}= 9.67, 106.22). And finally, between long and short passives with perception verbs there are significant differences as well (OR = 0.37, CI_{95%}=0.20, 0.69).

Table 8 Percentage of correct answers based on Sentence Type.

	Percentage of correct answers	CI _{95%}
Act Actives	98.59%	96.55% 99.43%
Percep Actives	99.55%	98.06% 99.89%
Short pass	68.56%	57.87% 77.59%
Long pass	44.97%	34.13% 56.13%

It is also relevant to see if there is an interaction of both effects (age and sentence type). A stratified model for each age group was established to describe the number of correct

answers between the types of sentences. In Table 9, the percentage of correct answers can be found according to age groups and sentence type.

Table 9 Percentage of correct answers per age group and sentence type.

	Age group						
	4	5	6	7	8	9 - 10	Adults
Act active	85%	95%	100%	97.50%	100%	100%	100%
Percep active	100%	97.50%	100%	97.50%	100%	100%	100%
Short pass	35%	35%	50%	77.50%	82.50%	90%	100%
Long pass	35%	32.50%	15%	52.50%	55%	87.50%	100%

At the ages of 4 and 5, there is no significant difference between the two types of active sentence (active with actional verb and active with perception verb), nor is there any difference between short and long passives. It is not until the age of 6 that we find statistically significant differences between long and short passives with perception verbs ($t = -3.22$; $p\text{-value} = 0.0104$). At the age of 7, there are only significant differences between actives (both with actional and with perception verbs) and long passives ($t = 3.6$; $p\text{-value} = 0.0065$). At the age of 8, again we find differences that are statistically significant between long and short passives with perception verbs ($t = -2.95$; $p\text{-value} = 0.0161$). When we analyse the group of 9-10-year-olds, there is no difference in their performance depending on the type of sentence.

To estimate the number of correct answers in each age, a stratified model for each Sentence Type was established. Focusing first on the actives, it can be seen that, from the age of 4, participants had an adult-like performance, with no significant difference regarding the type of verb used (perception or actional).

There are statistically significant differences in the short passives when taking into consideration the age of the participants ($F\text{ value} = 7.98$; $p\text{-value} < 0.0001$). The same happens if we compare the answers for long passives between the different groups of age ($F\text{ value} = 7.57$; $p\text{-value} < 0.0001$).

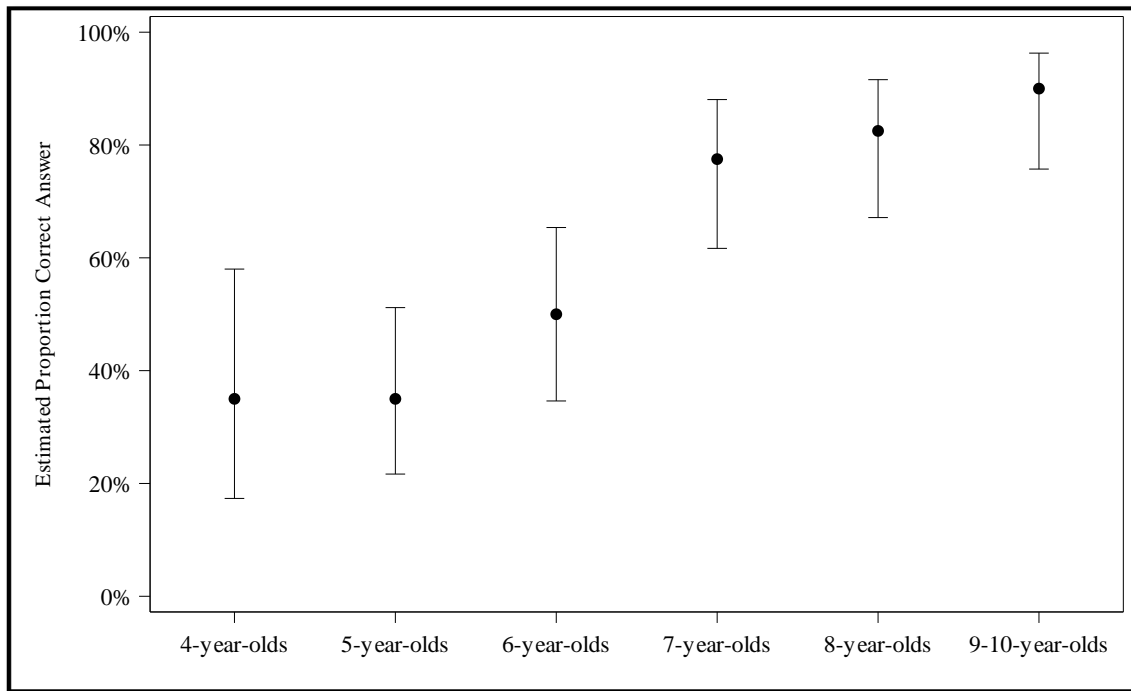


Figure 4 Short passive results for each age group

If we look at short passives (see Figure 4), there are statistically significant differences between 4 and 7-year-olds ($t = -3.08$; $p\text{-value} = 0.0376$); between 4 and 8-year-olds ($t = -3.46$; $p\text{-value} = 0.0135$); between 4 and 9-10-year-olds ($t = -3.99$; $p\text{-value} = 0.0028$). Also, there are significant differences between the age of 5 and 7 ($t = -3.69$; $p\text{-value} = 0.0071$); between 5 and 8-year-olds ($t = -4.08$; $p\text{-value} = 0.0022$) and finally between 5 and 9-10-year-olds ($t = -4.52$; $p\text{-value} = 0.0005$). Additionally, there are significant differences between the group age of 6 and 8-year-old children ($t = -4.08$; $p\text{-value} = 0.0022$) and between the age of 6 and 9-10-year-olds ($t = -3.57$; $p\text{-value} = 0.0098$). It is not until the age of 7 that the subjects perform above-chance in short passives (77.5%; $CI_{95\%} = 61.68\%, 88.06\%$).

On the other hand, when considering the results of long passives (see Figure 5), there are significant differences between all age groups and 9-10-year-olds; between 6 and 7-year-olds ($t = -3.37$; $p\text{-value} = 0.0174$) and also between 6 and 8-year-olds ($t = -3.55$; $p\text{-value} = 0.0105$). It is not until the age of 9-10 that the performance with long passives is above chance (87.5%; $CI_{95\%} = 72.81\%, 94.82\%$), which clearly confirms that there is a delay in the acquisition of passives, compared to that of actives.

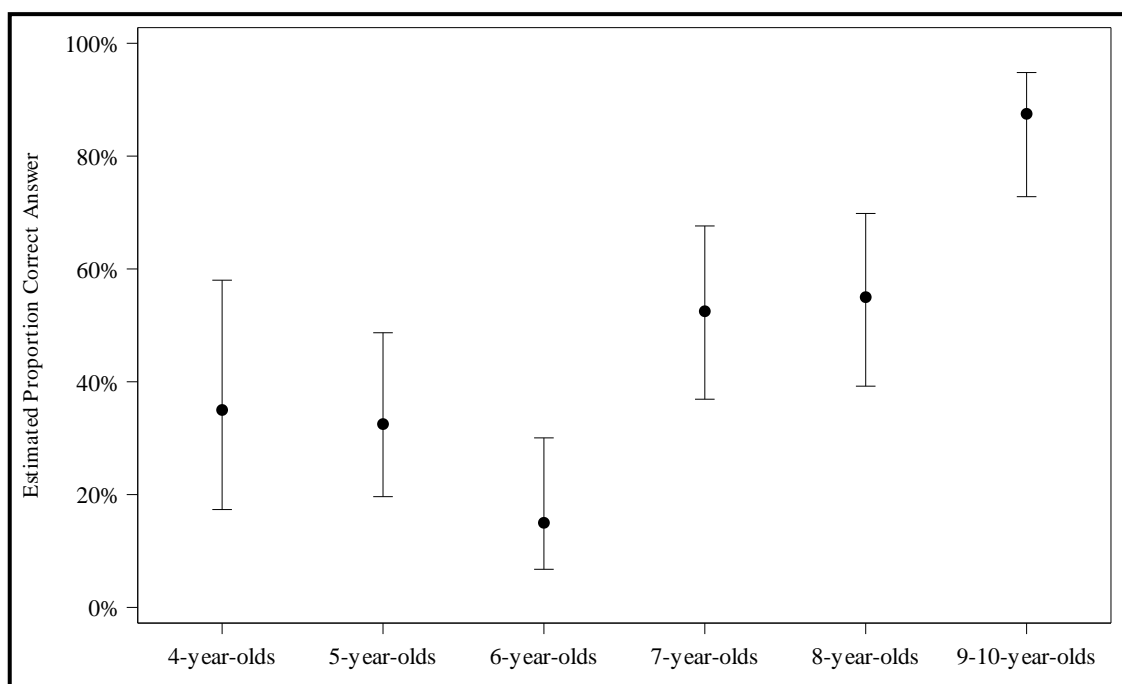


Figure 5 Long passive results for each age group

Therefore, we can say that it is not until the age of 9-10 that Catalan long passives with perception are comprehended.

Finally, the effect of verb type has also been studied for each type of passive and age group and the results show that there are no statistically significant differences between the perception verbs *sentir* ('hear') and *veure* ('see').

4. DISCUSSION

The current study shows that there is a delay in the acquisition of passives in Catalan, as it had been shown before in many other languages such as English, Greek, Portuguese, Spanish, as well as in previous studies about Catalan. The results from this study are in accordance with the maturation hypothesis proposed by Borer and Wexler (1987). Analysing the data in relation to age, we see that there is a clear improvement, although not gradual, as subjects grow; children aged 4, 5 and 6 performed very similarly but from age 7 the improvement was more significant. This may be explained if the derivation of passives goes in hand with the maturation of syntactic mechanisms that, at an early age, are not available. Despite Borer and Wexler (1987) having set maturation at age 5, later studies have shown this maturation to happen later. Gavarró and Parramon (2017) argued that maturation for Catalan children does not take place until

the age of 7, given the results of their second experiment, and in this study, maturation seems to take place at age 7 in an experiment similar to their first experiment.

Regarding the effect of voice, we can confirm that Catalan children's performance with active sentences (98.18%) is superior to the comprehension of passive sentences (55.68%) because with the active voice, children from age 4 already show an adult-like performance. This is consistent with previous studies about Catalan (Gavarró and Parramon, 2017; Cunill, 2012).

The results from this study on Catalan passives with perception verbs can be compared with previous studies on Catalan passives. As it was expected, short passives are comprehended earlier than long passives in Catalan, as Borer and Wexler (1987) found for English passives. Secondly, actional passives are expected to be acquired earlier than psychological passives, due to the fact that actional verbs seem to be interpreted as adjectival and non-actional verbs do not. Looking first at the studies with actional verbs, Gavarró and Parramon (2017) found that while short passives were understood above-chance at age 3, long passives were not comprehended above-chance until age 6. Cunill's (2012) results were similar for the long actional passive (6;9) but, for the short actional passives, only participants aged 5;10 showed an above-chance performance.

Besides, Cunill (2012) also tested psychological passives but with the following verbs: *recordar* ('remember'), *odiar* ('hate'), *estimar* ('love') and *veure* ('see'). He found a different acquisition age of these passives compared to the actional passives. In that study, short psychological passives were not comprehended until the age of 7;7, but they still encountered difficulties with long psychological passives. Our experiment's results for short passives with perception verbs are similar to Cunill's. For short passives with perception verbs, children only performed above-chance (77.5%) from the age of 7. For long passives with perception verbs we had to test older children than Cunill's participants to discover that it is at age 9-10 that Catalan children perform above-chance (87.5%) with this type of passive.

A general conclusion can be drawn from these results: Catalan children perform better with actional passives than with psychological and perception passives. A possible explanation for this, according to what has been concluded from previous studies (Gavarró and Parramon, 2017; Oliva and Wexler, to appear), is that Catalan children are able to use the adjectival interpretation to comprehend verbal passives despite the change of auxiliary. This explains why long passives are also more delayed than short passives, because *by-phrases* are not compatible with the adjectival strategy. Thus,

when Catalan children hear a long passive they are not be able to apply the adjectival strategy and, therefore, long passives are not understood until the syntactic mechanisms that derive verbal passives have matured.

It is important to contrast these results from Catalan passives with the recent study about Spanish passives by Oliva and Wexler (to appear). Overall, there is consistency between their results and Gavarró and Parramon's results on the short actional passives. However, for the long actional passives, while in Gavarró and Parramon children aged 6 already performed like adults (92%), Spanish children were only at chance (62.5%), a difference for which we have no explanation. Considering psychological passives, in Spanish it is still unknown when children are above chance on short psychological passives because Oliva and Wexler's oldest group tested, aged 6, was only at chance (53.3%). Contrasting this with our results, Catalan children did not perform above-chance (77.5%) until age 7. When it comes to long psychological passives Catalan 9-10-year-olds children are above-chance with this structure. In Spanish it remains unknown when children comprehend long psychological passives because Oliva and Wexler's oldest group, 6-year-olds, still performed at chance (49.2%). There are no unexpected differences between the results for Spanish and those for Catalan.

Finally, in this study no difference was found between the comprehension of *sentir* ('hear') and *veure* ('see') in the comprehension of passive sentences; in contrast, the study carried out for Portuguese passives (Agostinho & Gavarró, 2017) obtained different results. Children from age 5 seemed to comprehend the passives with the verb *ver* ('see') better than the passives with the verb *ouvir* ('hear'). This can be explained considering that *ver* ('see') can be given an actional interpretation, with a meaning similar to 'discover' or 'find'. Therefore, *ver* can be given an agentive reading, making it possible to apply the adjectival strategy than with *ouvir*.

5. CONCLUSION

Passivisation is one of the most studied topics in the field of first language acquisition and it is now well known that it is a delayed aspect of grammar, not only in English but also in a wide variety of languages.

This study provides new evidence that Catalan passives are also acquired at a late age and some new results have been obtained. This study supports the already existing results about actives being well comprehended from an early age, independent of the

type of verb used, actional or perception. When it comes to passives, we find there is a greater difficulty in comprehension. Comparing the results from previous studies on Catalan actional passives with the new data on Catalan psychological passives, there is a clear delay in the acquisition of psychological passives, compared to the acquisition of actional passives, as it has been shown in many other languages. This is due to the fact that actional verbs can be interpreted as well-formed adjectives, as Borer and Wexler (1987) found, whereas psychological verbs cannot; thereby, psychological passives make a stative –or adjectival– reading impossible.

Earlier studies (Cunill, 2012) found that short psychological passives in Catalan are comprehended from the age of 7;7, and our data supports this finding. Our study demonstrates for the first time that Catalan children do not correctly comprehend long psychological passives –in this case, with perception verbs– until the age of 9-10. This corresponds to what Hirsch and Wexler (2006b) argued, namely that maturity for psychological passives best reflects maturation, which is genetically determined and that appears to occur at a late stage (2006b: 258).

When these results from the acquisition of psychological passives in Catalan are compared to the results from the recent study on Spanish psychological and actional passives (Oliva and Wexler, to appear), we observe that Catalan children at age 7 are above-chance in the comprehension of short psychological passives, while Spanish children aged 6 are still at chance. The equivalent study of long psychological passives for Spanish is still to be carried out.

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APPENDIX

a. List of items

1. El nen és vist per l'avi.
2. El pare tapa el nen.
3. La mare és vista per la nena.
4. El nen és sentit.
5. La nena veu l'àvia.
6. L'avi pentina el nen.
7. La mare és sentida.
8. L'avi sent el nen.
9. La nena és vista.
10. La mare sent la nena.
11. El pare és vist.
12. La nena renta la mare.
13. La nena és sentida per la mare.
14. El nen veu el pare.
15. El nen pinta l'avi.
16. El pare és sentit pel nen.

b. Individual results for each age group

4-year-olds

Items					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subject	Date of birth	Age	School	Date Experiment	Long passive	Active actional	Long passive	Short passive	Active percep	Active actional	Short passive	Active percep	Short passive	Active percep	Short passive	Active actional	Long passive	Active percep	Active actional	Long passive
1	17/08/2013	4;6;21	Guerau de Liost	7.3.2018	1	1	0	1	1	1	1	1	0	1	0	1	1	1	1	1
2	05/11/2013	4;4;2	Guerau de Liost	7.3.2018	0	1	0	0	1	1	1	1	0	1	0	1	0	1	1	0
3	13/04/2013	4;10;25	Guerau de Liost	7.3.2018	1	1	0	1	1	0	0	1	0	1	0	1	1	1	1	1
4	02/09/2013	4;6;5	Guerau de Liost	7.3.2018	0	1	0	0	1	1	0	1	1	1	0	1	0	1	1	0
5	10/06/2013	4;8;28	Guerau de Liost	7.3.2018	0	1	0	0	1	0	0	1	1	1	1	1	0	1	0	1

5-year-olds

Items					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subject	Date of birth	Age	School	Experiment Date	Long passive	Active actional	Long passive	Short passive	Active percep	Active actional	Short passive	Active percep	Short passive	Active percep	Short passive	Active actional	Long passive	Active percep	Active actional	Long passive
6	22/06/2012	5;8;7	Anna Mogas	26.2.2018	0	1	0	0	1	1	1	1	0	1	0	1	0	1	1	0
7	20/10/2012	5;4;8	Anna Mogas	26.2.2018	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0
8	29/12/2012	5;1;29	Anna Mogas	26.2.2018	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
9	29/12/2012	5;1;29	Anna Mogas	26.2.2018	1	1	0	0	0	1	0	1	1	1	0	1	0	1	1	0
10	25/08/2012	5;6;4	Anna Mogas	26.2.2018	1	1	0	0	1	1	0	1	0	1	0	1	0	1	1	0
11	22/06/2012	5;8;16	Guerau de Liost	7.3.2018	0	1	0	0	1	1	0	1	0	1	0	1	0	1	1	0
12	25/06/2012	5;8;13	Guerau de Liost	7.3.2018	0	1	0	0	1	1	0	1	0	1	0	1	0	1	0	0
13	08/03/2012	5;11;28	Guerau de Liost	7.3.2018	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1
14	30/03/2012	5;11;6	Guerau de Liost	7.3.2018	1	1	0	1	1	1	1	1	0	1	0	1	1	1	1	1
15	05/05/2012	5;10;3	Guerau de Liost	9.3.2018	0	1	1	0	1	0	1	1	1	1	0	1	0	1	1	0

6-year-olds

Items					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subject	Date of birth	Age	School	Date Experiment	Long passive	Active actional	Long passive	Short passive	Active percep	Active actional	Short passive	Active percep	Short passive	Active percep	Short passive	Active actional	Long passive	Active percep	Active actional	Long passive
16	25/02/2011	6;11;29	Anna Mogas	23.2.2018	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0
17	25/08/2011	6;5;29	Anna Mogas	23.2.2018	0	1	0	1	1	1	1	1	0	1	0	1	0	1	1	0
18	22/12/2011	6;2;1	Anna Mogas	23.2.2018	0	1	0	0	1	1	0	1	0	1	0	1	0	1	1	0
19	29/05/2011	6;8;24	Anna Mogas	23.2.2018	0	1	0	1	1	1	1	1	0	1	0	1	0	1	1	0
20	18/05/2011	6;9;5	Anna Mogas	23.2.2018	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	0
21	04/08/2011	6;6;19	Anna Mogas	23.2.2018	0	1	0	0	1	1	0	1	0	1	1	1	0	1	1	1
22	29/01/2012	6;1;0	Anna Mogas	26.2.2018	0	1	0	0	1	1	0	1	0	1	1	1	0	1	1	0
23	13/07/2011	6;7;25	Guerau de Liost	9.3.2018	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0
24	25/04/2011	6;10;14	Guerau de Liost	9.3.2018	1	1	0	0	1	1	0	1	1	1	1	1	0	1	1	0
25	24/07/2011	6;7;14	Guerau de Liost	9.3.2018	1	1	0	0	1	1	0	1	1	1	1	1	0	1	1	0

7-year-olds

Items					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subject	Date of birth	Age	School	Date Experiment	Long passive	Active actional	Long passive	Short passive	Active percep	Active actional	Short passive	Active percep	Short passive	Active percep	Short passive	Active actional	Long passive	Active percep	Active actional	Long passive
26	18/01/2011	7;1;5	Anna Mogas	23.2.2018	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0
27	31/07/2010	7;6;22	Anna Mogas	23.2.2018	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
28	11/11/2010	7;3;12	Anna Mogas	23.2.2018	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
29	23/04/2010	7;10;23	Anna Mogas	23.2.2018	0	1	1	0	1	1	1	1	0	1	1	1	0	1	1	1
30	01/12/2010	7;2;22	Anna Mogas	23.2.2018	0	1	0	1	1	1	0	1	0	1	1	1	0	1	1	0
31	06/02/2011	7;1;2	Guerau de Liost	9.3.2018	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1
32	22/09/2010	7;5;17	Guerau de Liost	9.3.2018	0	1	0	1	1	1	1	1	0	1	0	1	0	1	1	0
33	25/08/2010	7;6;14	Guerau de Liost	9.3.2018	0	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1
34	13/11/2010	7;3;30	Guerau de Liost	9.3.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35	11/08/2010	7;6;28	Guerau de Liost	9.3.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

8-year-olds

Items					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subject	Date of birth	Age	School	Date Experiment	Long passive	Active actional	Long passive	Short passive	Active percep	Active actional	Short passive	Active percep	Short passive	Active percep	Short passive	Active actional	Long passive	Active percep	Active actional	Long passive
36	08/02/2010	8;0;15	Anna Mogas	23.2.2018	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	0
37	09/01/2010	8;1;14	Anna Mogas	23.2.2018	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0
38	22/04/2009	8;10;1	Anna Mogas	23.2.2018	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0
39	02/09/2009	8;5;21	Anna Mogas	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
40	07/10/2009	8;4;16	Anna Mogas	23.2.2018	0	1	0	0	1	1	0	1	0	1	1	1	0	1	1	0
41	20/07/2009	8;7;3	Anna Mogas	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
42	24/07/2009	8;7;0	Anna Mogas	23.2.2018	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
43	25/06/2009	8;7;29	Anna Mogas	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
44	27/10/2009	8;3;26	Anna Mogas	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
45	13/01/2010	8;1;26	Guerau de Liost	9.3.2018	0	1	0	0	1	1	1	1	0	1	1	1	0	1	1	1

9-10-year-olds

Items					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subject	Date of birth	Age	School	Date Experiment	Long passive	Active actional	Long passive	Short passive	Active percep	Active actional	Short passive	Active percep	Short passive	Active percep	Short passive	Active actional	Long passive	Active percep	Active actional	Long passive
46	14/01/2009	9;1;09	Anna Mogas	23.2.2018	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
47	17/02/2009	9;0;6	Anna Mogas	23.2.2018	1	1	1	0	1	1	0	1	1	1	1	1	0	1	1	1
48	19/02/2009	9;0;4	Anna Mogas	23.2.2018	0	1	0	1	1	1	1	1	1	1	0	1	0	1	1	1
49	11/06/2008	9;10;2	Guerau de Liost	23.2.2018	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
50	20/03/2008	10;0;22	Guerau de Liost	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
51	27/11/2008	9;4;17	Guerau de Liost	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
52	31/01/2008	10;1;11	Guerau de Liost	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
53	15/07/2008	9;8;28	Guerau de Liost	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
54	30/03/2008	10;0;2	Guerau de Liost	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
55	13/11/2008	9;5;0	Guerau de Liost	23.2.2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Adults

Items				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subject	Date of birth	Age	Date Experiment	Long passive	Active actional	Long passive	Short passive	Active percep	Active actional	Short passive	Active percep	Short passive	Active percep	Short passive	Active actional	Long passive	Active percep	Active actional	Long passive
56	13/10/1965	52;4;10	23/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
57	11/07/1966	51;7;12	23/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
58	07/02/1975	43;0;16	23/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
59	19/05/1972	45;9;4	23/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	17/08/2000	17;6;6	23/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
61	29/05/2001	16;8;22	23/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
62	12/03/1996	21;11;15	27/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
63	15/03/1996	21;11;12	27/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
64	17/06/1996	21;8;10	27/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
65	24/08/1996	21;6;3	27/02/2018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1